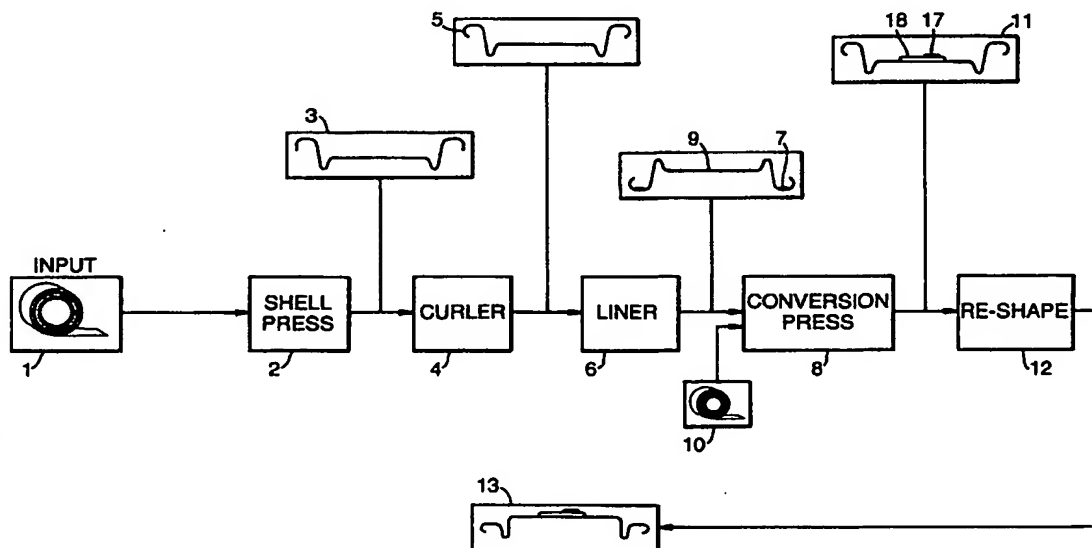




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(21) International Application Number: PCT/GB98/01072 (22) International Filing Date: 14 April 1998 (14.04.98) (30) Priority Data: 9707678.0 16 April 1997 (16.04.97) GB (71) Applicant (for all designated States except LS US): CROWN CORK & SEAL TECHNOLOGIES CORPORATION [US/US]; 11535 S. Central Avenue, Alsip, IL 60803-2599 (US). (71) Applicant (for LS only): CARNAUDMETALBOX PLC [GB/GB]; Downsvie Road, Wantage, Oxfordshire OX12 9BP (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): ROBERTS, David, Andrew [GB/GB]; 33 Tattersall Close, Wokingham, Berkshire RG40 2LP (GB). (74) Agent: GADSDEN, Robert, Edward; Carnaudmetalbox plc, Downsvie Road, Wantage, Oxfordshire OX12 9BP (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: CONTAINER END MANUFACTURE



(57) Abstract

A can end (13) is manufactured by forming an end shell (5) comprising a seaming flange, chuck wall, centre panel and countersink etc. The end shell is converted to an easy open can end by forming a score and raising a rivet on the centre panel, and attaching a tab to the rivet. The end is subsequently reformed by moving the centre panel (9) relative to the seaming flange (7) to raise the centre panel to a height above the level of the seaming flange. The end is secured to a can body which has been filled with product, and then reformed a second time to lower the centre panel (9) to a height below the level of the seaming flange (7), in order to reduce the headspace within the package.

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"CONTAINER END MANUFACTURE"

This invention relates to can ends, and particularly to ends for cans filled with food or non-carbonated beverages.

In cans for carbonated beverages the internal pressure generated by the carbon dioxide content of the product contributes significant strength to the very thin sidewalls of the cans. In contrast, non-carbonated products are frequently hot filled into cans and when such cans are cooled an internal vacuum is developed. This dictates that the can walls should be relatively thick to withstand the vacuum without collapsing or panelling. Much effort has been devoted to methods intended to ensure that the pressure in the headspace of the can containing a non-carbonated product is maintained at a pressure significantly above atmospheric throughout its storage life, thereby facilitating the use of lightweight DWI cans for such products. Mechanical pressurisation processes have been proposed in US 4836398 and EP 0521642A. In these proposals, the can is provided with at least one deformable wall element, generally in the top or bottom end of the can, which is deformed after filling and seaming to reduce the internal volume of the can and thus to increase the internal pressure. The present invention seeks to provide a manufacturing process for deformable can ends of this type, which is both efficient and reliable.

Accordingly, there is provided a method of manufacturing a can end comprising the steps of:-

- i) forming an end shell comprising a radially outer seaming flange, a chuck wall adjacent the seaming flange, a centre panel and an axially downward countersink joining the centre panel to the chuck wall;

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ii) converting the shell to an easy open can end by the steps of:-

- a) forming a score on a portion of the centre panel,
- 5 b) raising a rivet on the centre panel, and
- c) forming a tab and attaching the tab to the rivet,

and subsequently,

10 iii) reforming the end by moving the centre panel and the seaming flange one with respect to the other to raise the centre panel above the level of the seaming flange.

The invention further resides in a method of manufacturing a package comprising the steps of:

15 i) forming an end shell comprising a radially outer seaming flange, a chuck wall adjacent the seaming flange, a centre panel and an axially downward countersink joining the centre panel to the chuck wall;

20 ii) converting the shell to an easy open can end by the steps of:-

- a) forming a score on a portion of the centre panel,
- b) raising a rivet on the centre panel, and
- 25 c) forming a tab and attaching the tab to the rivet,

iii) subsequently reforming the end by moving the centre panel and the seaming flange one with respect to the other to raise the centre panel above the level of the seaming flange;

30 iv) securing the end onto a can body which has been filled with product, and

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v) performing a second reforming operation on the can end to move the centre panel and the seaming flange one with respect to the other to lower the centre panel to a height below the seaming flange, thereby reducing the headspace within the package.

The methods described above have the advantage that an end shell of conventional shape is first formed and is then reshaped into a can end having a "high" centre panel, rather than requiring the manufacture of a completely new design of end shell. However, the material from which the can end is manufactured must be softer than that conventionally used, to be able to withstand both the first and second reforming of the centre panel.

The invention further resides in a further method of manufacturing a can end comprising the steps of:

- i) forming an end shell comprising a radially outer seaming flange, a chuck wall adjacent the seaming flange, a centre panel and an axially downward countersink joining the centre panel to the chuck wall;
- ii) supporting the end shell in a carrier belt;
- iii) moving the carrier belt to transport the end shell to a conversion station, where the shell is converted to an easy open end by the steps of:
 - a) forming a score on a portion of the centre panel,
 - b) raising a rivet on the centre panel, and
 - c) forming a tab and attaching the tab to the rivet,
- iv) moving the carrier belt to transport the converted end to a reform station, where the end is reformed by moving the centre panel and the seaming

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flange one with respect to the other to raise the centre panel above the level of the seaming flange.

In this way it is possible that these deformable can ends can be manufactured on equipment similar to that used for the manufacture of conventional beverage can ends, or even by modifying existing equipment.

Surprisingly, the additional reforming of the centre panel can be carried out directly after the can end leaves the conversion station, rather than requiring the can ends to be transported to a separate reforming machine. Conveniently, the step of reforming the can ends comprises the steps of:

- 1) clamping the radially outer seaming flange of the end by means of a clamping ring, and
- 2) moving the clamping ring and a punch one with respect to the other so as to push the centre panel upwardly to a position above the level of the seaming flange.

The reforming step preferably includes moving the punch upwardly with respect to the clamping ring.

The invention will now be further described, by way of example only, with reference to the accompanying drawings in which:-

Fig.1 is a schematic process diagram showing the stages in the manufacture of can ends according to the method of the present invention; and

Figs. 2A and 2B are schematic sectional views of tooling for the reshaping of can ends according to the method of Fig.1.

Referring to Fig.1 a process for the manufacture of can ends is shown in schematic form. A coil 1 of pre-lacquered and lubricated aluminium alloy is fed to a

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shell press 2 which stamps out blanks and forms them into a shell shown generally at 3. There are a variety of techniques for forming these end shells, and examples are given in US 4571978, US 4109599 and EP 0398529B to name
5 but three. The end shell 2 is then fed on a carrier belt to a curler 4 which curls over the edges of the shell to form a seaming flange shown at 5. The curled shells 4 are then fed into a liner 6 where they are inverted, spun and compound is injected onto the underside of the
10 seaming flange as shown at 7. One example of a lining machine is given in GB 2042373.

The lined end shells are then fed on the carrier belt to a conversion press, shown generally at 8. A rivet 17 is raised on the centre panel 9 of the shell,
15 and a score is applied to the centre panel to define a portion operable to produce an opening therein. More aluminium end stock 10 is used to produce a tab 18 which is staked to the end shell via the rivet on the centre panel. The resulting can end is shown generally at 11.

20 The can ends 11 are then fed on the carrier belt to a reshaping station 12 where the centre panel 9 is pushed upwardly to form the completed can end shown at 13.

Fig.2A shows the can end 11 (shown minus its tab 18 for the sake of clarity) at the reshaping station 12.
25 The centre panel 9 of the can end is pushed upwardly by a punch 14, the seaming flange 5 of the end being supported by a seaming panel support ring 15 and curl support ring 16 respectively. Once the end has been reshaped as shown in Figure 2B, the punch 14 is retracted, and the can end
30 exits the reshaping station 12 on the carrier belt.

CLAIMS:

1. A method of manufacturing a can end comprising the steps of:-

i) forming an end shell comprising a radially outer seaming flange, a chuck wall adjacent the seaming flange, a centre panel and an axially downward countersink joining the centre panel to the chuck wall;

ii) converting the shell to an easy open can end by the steps of:

a) forming a score on a portion of the centre panel,

b) raising a rivet on the centre panel, and

c) forming a tab and attaching the tab to the rivet,

and subsequently,

iii) forming the end by moving the centre panel and the seaming flange one with respect to the other to raise the centre panel above the level of the seaming flange.

2) A method of manufacturing a package comprising the steps of:

i) forming an end shell comprising a radially outer seaming flange, a chuck wall adjacent the seaming flange, a centre panel and an axially downward countersink joining the centre panel to the chuck wall;

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ii) converting the shell to an easy open can end by the steps of:

- a) forming a score on a portion of the centre panel,
- b) raising a rivet on the centre panel, and
- c) forming a tab and attaching the tab to the rivet,

iii) subsequently forming the end by moving the centre panel and the seaming flange one with respect to the other to raise the centre panel above the level of the seaming flange;

iv) securing the end on to a can body which has been filled with product, and

v) performing a second reforming operation on the can end to move the centre panel and the seaming flange one with respect to the other to lower the centre panel to a height below the level of the seaming flange, thereby reducing the headspace within the package.

3. A method of manufacturing a can end comprising the steps of:

i) forming an end shell comprising a radially outer seaming flange, a chuck wall adjacent the seaming flange, a centre panel and an axially downward countersink joining the centre panel to the chuck wall;

ii) supporting the end shell in a carrier belt;

iii) moving the carrier belt to transport the end shell to a conversion station, where the shell is converted to an easy open end by the steps of:

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- a) forming a score on a portion of the centre panel,
 - b) raising a rivet on the centre panel, and
 - c) forming a tab and attaching the tab to the rivet,
- iv) moving the carrier belt to transport the converted end to a reform station, where the end is reformed by moving the centre panel and the seaming flange one with respect to the other to raise the centre panel above the level of the seaming flange.
4. A method according to any preceding claim, wherein the step of reforming the end comprises the steps of:
- i) clamping the radially outer seaming flange of the end by means of a clamping ring, and
 - ii) moving the clamping ring and a punch one with respect to the other so as to push the centre panel upwardly to a position above the level of the seaming flange.
5. A method according to claim 4, wherein the reforming step includes moving the punch upwardly with respect to the clamping ring.

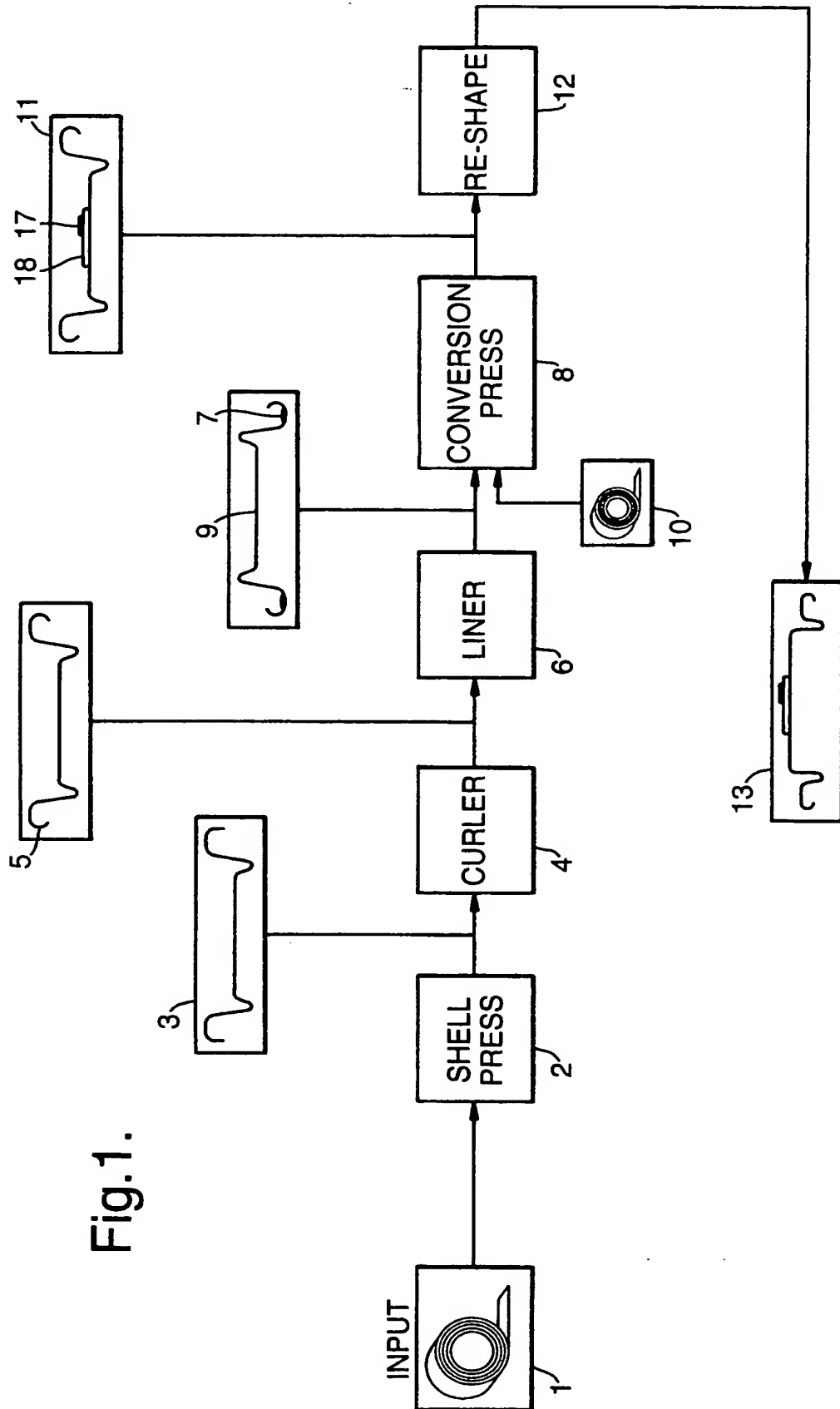


Fig.1.

Fig.2A.

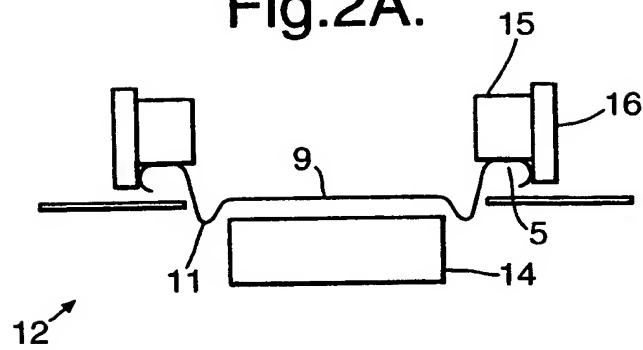
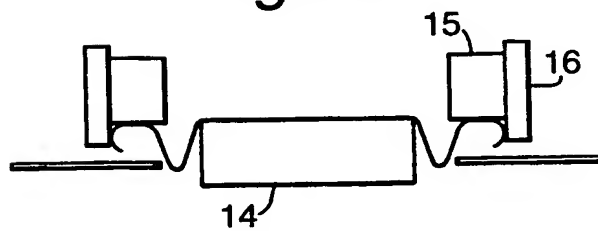


Fig.2B.



INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/GB 98/01072

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B21D51/38

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 836 398 A (LEFTAULT JR CHARLES J ET AL) 6 June 1989 cited in the application see the whole document ----	1-3
A	GB 2 259 075 A (CMB FOODCAN PLC) 3 March 1993 cited in the application see the whole document ----	1-3
A	US 4 967 538 A (LEFTAULT JR CHARLES J ET AL) 6 November 1990 see the whole document ----	1-3
A	US 3 704 140 A (PETIT MAURICE ET AL) 28 November 1972 see the whole document -----	1-3

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4836398 A	06-06-1989	US 4967538 A	06-11-1990
GB 2259075 A	03-03-1993	NONE	
US 4967538 A	06-11-1990	US 4836398 A	06-06-1989
US 3704140 A	28-11-1972	BE 742669 A	14-05-1970
		CH 518682 A	15-02-1972
		DE 1964705 A	25-06-1970
		DK 141954 B	28-07-1980
		FI 49672 B	02-06-1975
		FR 1599563 A	15-07-1970
		GB 1235060 A	09-06-1971
		JP 49028628 B	27-07-1974
		LU 59998 A	11-02-1970
		NL 6919525 A, B	02-07-1970
		OA 3185 A	15-12-1970
		SE 363575 B	28-01-1974